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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/556,777	04/25/2000	Akira Goda	0039-7692-2S	8088

7590 12/10/2001

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EXAMINER

SOWARD, IDA M

ART UNIT	PAPER NUMBER
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2822

DATE MAILED: 12/10/2001

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 09/556,777	<b>Applicant(s)</b> GODA ET AL.	
	<b>Examiner</b> Ida M Soward	<b>Art Unit</b> 2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 10/23/01.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) 6-10 and 15-18 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-5 and 11-14 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

#### Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                  | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____  |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                         | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>5</u> . | 6) <input type="checkbox"/> Other: _____                                    |

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### DETAILED ACTION

1. This office action is in response to the election without traverse received on 10/23/01.

#### *Priority*

2. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

#### *Claim Rejections - 35 USC § 103*

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1-3 and 5 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Iwahashi et al. (4,495,693).

Iwahashi teaches a nonvolatile semiconductor memory device (abstract) comprising: a semiconductor substrate (Fig. 11L, Ref. # **128**); a first transistor formed in a peripheral circuit portion **166** of the semiconductor substrate, a gate electrode **138c** of the first transistor having a first gate length; a second transistor formed in a memory cell portion **120** of the second transistor

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having a second gate length **122** shorter than the first gate length **138c**; and a first insulating film **158** formed above at least the memory cell portion, the first insulating film covering the second transistor. Also, the limitations of the first insulating layer having a property which makes it difficult for an oxidizing agent to pass therethrough and the gate electrodes being oxidized are inherent in the art of semiconductor devices. One of the purposes of insulating layers is to protect the device from such oxidizing agents as oxygen and ozone. In addition, gate material and other material become oxidized when exposed to the atmosphere.

6. Claims 4, 11 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iwahashi et al. (4,495,693) as applied to claims 1-3 and 5 above, and further in view of Yokoi et al. (4,866,003).

Yokoi et al. teach an insulating film **7** used as an etching stopper when contact holes **8 and 9** are formed, a silicon nitride film **12** covering the transistor, and a concentration of hydrogen in the silicon nitride that is smaller than  $3 \times 10^{21}$  atom/cm<sup>3</sup> (col. 3, lines 37-41). However, Iwahashi et al. fail to teach these limitations. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to take the invention of Iwahashi et al. and modify it with the invention of Yokoi et al. to provide a semiconductor device which is free from the deterioration in device characteristics due to hot carriers by having a reduced amount of hydrogen in the silicon nitride film.

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7. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Iwahashi et al. (4,495,693) and Yokoi et al. (4,866,003) as applied to claims 1- 5, 11, and 14 above, and further in view of Saito et al. (4,467,452).

Iwahashi et al. and Yokoi et al. fail to teach a silicon nitride film having a thickness of at most 50 nm. However, Saito et al. teach a silicon nitride film **66** having a thickness ranging from 40 to 60 nm (col. 6, lines 53-62) in which 50 nm is included. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the silicon nitride thickness of Saito et al. to provide a nonvolatile memory device with an excellent storage retention time.

8. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Iwahashi et al. (4,495,693) and Yokoi et al. (4,866,003) as applied to claims 1- 5, 11, and 14 above, and further in view of Tseng (5,731,130).

Iwahashi et al. and Yokoi et al. fail to teach an oxide film on the surface of the silicon nitride film having a thickness. Tseng teaches the oxidation of a silicon nitride film **40** with a preferred total thickness of about 1 to 10 nm (col. 8, lines 42-49). Thus, an oxide film not smaller than 1 nm and not larger than 10 nm could have been formed from the teachings of Tseng. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the oxidized silicon nitride film thickness of Tseng to provide a high dielectric silicon nitride film which is essentially pinhole free.

*Conclusion*

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9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ida M. Soward whose telephone number is (703) 305-3308. The examiner can normally be reached on Monday through Friday, from 7:30 am to 4:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached at (703) 308-4940. The Group fax number is (703) 308-7722.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956.

ims

December 3, 2001



Stephen D. Meier  
Primary Examiner